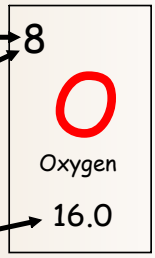
Write the standard atomic notation for the following elements:

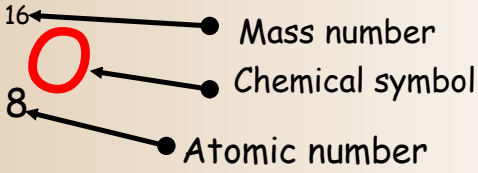
a) magnesium b) nitrogen c) sulfur d) gold

$^{24}_{12}Mg$ $^{14}_{7}N$ $^{32}_{16}S$ $^{197}_{79}Au$

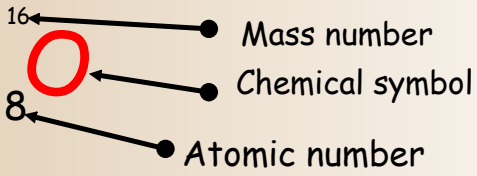
Recall:

- The number of protons = atomic number
- The number of protons = number of electrons
- Mass number = number of protons and neutrons
- Number of neutrons = mass number – atomic number
- Standard atomic notation





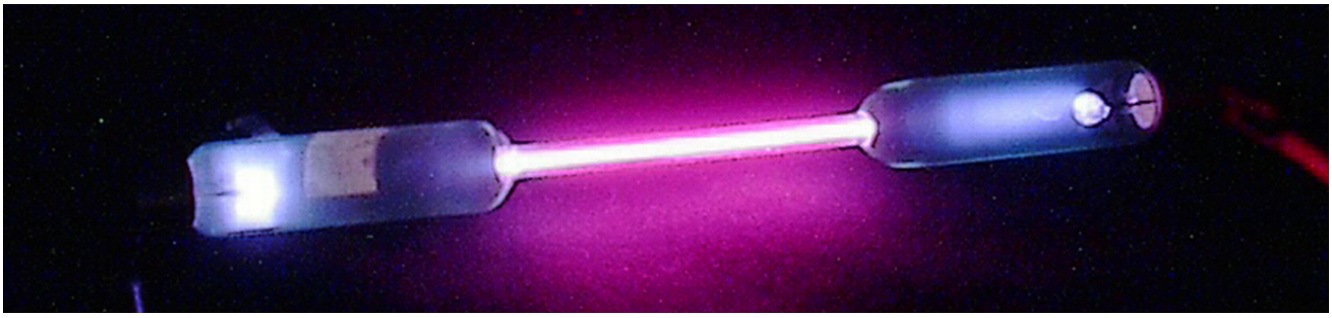
- Protons and Neutrons are found within the Nucleus of an atom, and make up the atomic mass.
- There fore the electrons are outside the nucleus but WHERE?????????



Niels Bohr (1885 – 1962)

- Was a Danish physicist who studied the parts of the atom especially the electron which were found outside of the nucleus

Niels Bohr (1885 – 1962)



- He studied light given off by gases that glowed when an electric current was passed through them

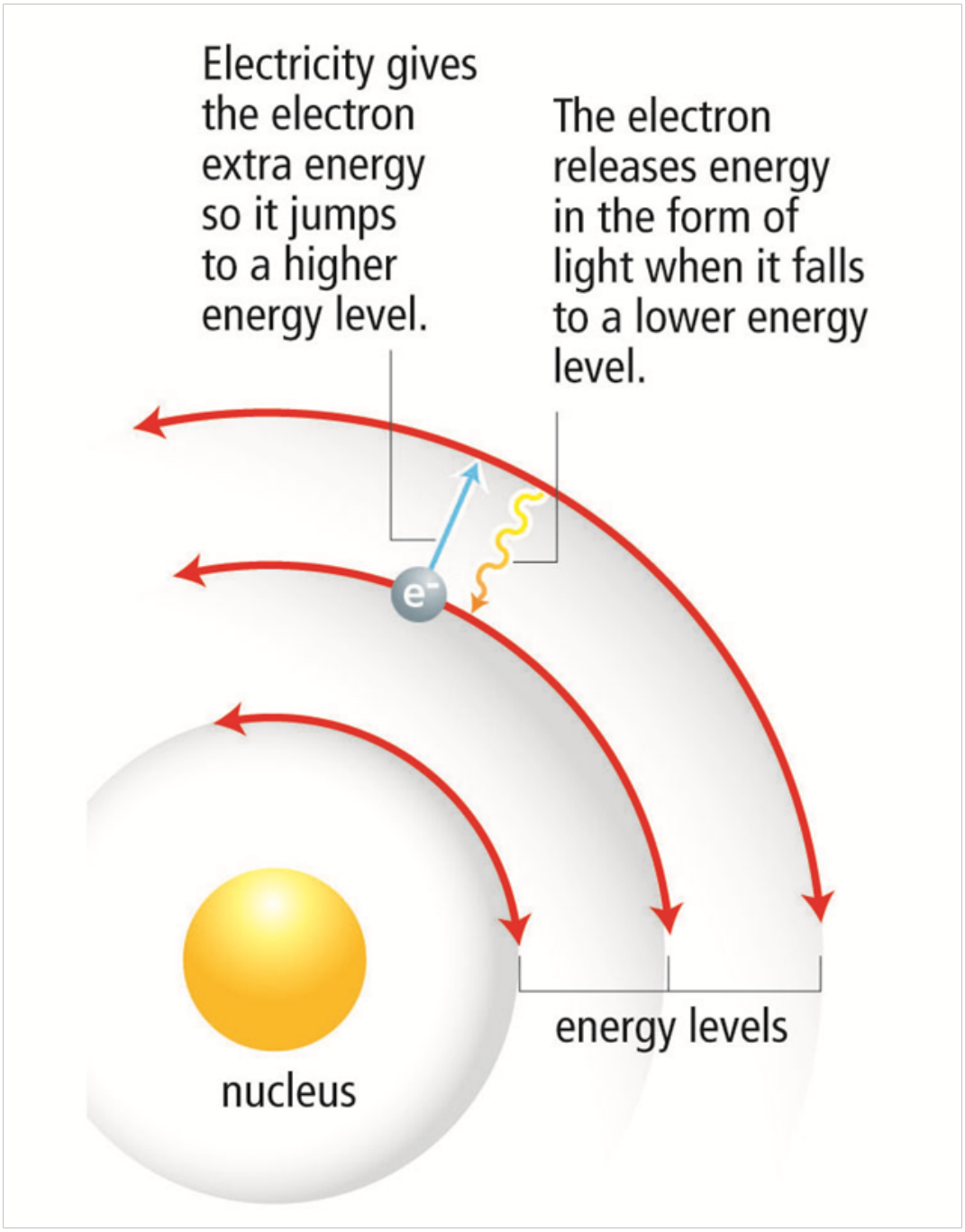
- He discovered that electron surround the nucleus in specific energy ‘levels’ or ‘shells’

Bohr's Model:

Electrons have different amounts of energy

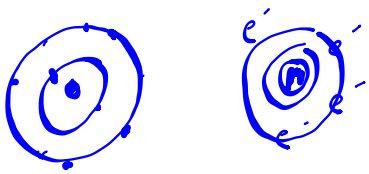
- Basically, electrons orbit the nucleus on specific paths called **orbits**

- If energy is supplied, they can jump to higher energy level paths.(Ions) . When the energy supply stops, the electrons 'fall' back to their original path.


Electricity gives the electron extra energy so it jumps to a higher energy level.
The electron releases energy in the form of light when it falls to a lower energy level.
e⁻
energy levels
nucleus

Bohr suggested that:

1. Electrons move around the nucleus in nearly circular paths called **orbits.**
2. Each orbit in has a definite amount of energy.
3. The further away the electrons away from the nucleus, the greater the energy.
4. Electrons cannot exist between these orbits, but can move up or down from one orbit to another.
5. The order of the filling of the electrons in the first five orbits is 2,8,8,18, 18
6. Electrons are more stable when they are lower energy and closer to the nucleus.

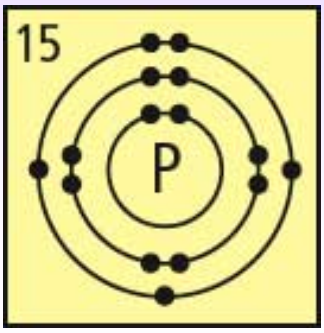


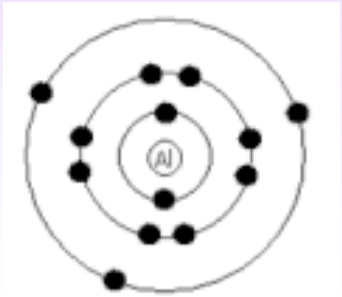
- We draw Bohr diagrams to visually represent the electronic structure of the element.
- In these diagrams the atomic symbol is written in the center to represent the nucleus
- A series of circles are drawn around the nucleus to represent the nucleus, and electrons are placed on these orbits.

Bohr Diagrams
page 92

We will start with Bohr diagrams page 92

The symbol is written in the center to represent the nucleus, more circles are drawn around the outside to represent the orbits and dots are drawn to show electrons.





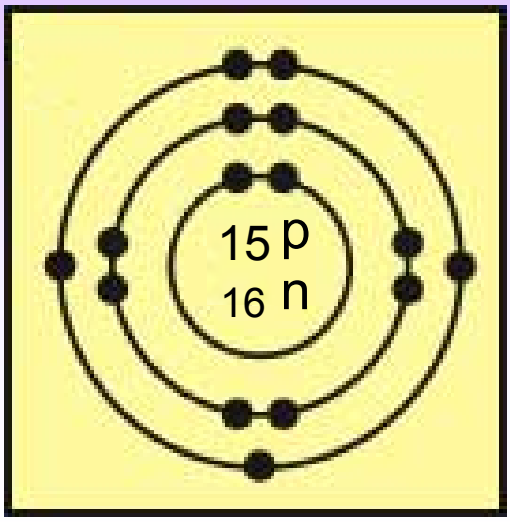
Electron arrangement for the Bohr Model

Each orbit (circle) can only hold so many electrons

Orbit	Number of Electrons
1	2
2	8
3	8
4	18
5	18

Bohr- Rutherford Model

Is a combination of Bohr's planetary model with Rutherford's nuclear model. These diagrams summarize the number and positions of all the three subatomic particles.



Atomic mass = 31

Phosphorus Atom

Creating Bohr-Rutherford Diagrams

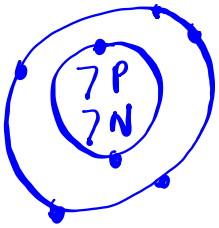
Follow these steps to make a Bohr diagram.

Step 1: Draw a circle (represents the nucleus) and put the number of neutrons and protons in the centre.

Step 2: Find out how many electrons the element has (periodic table)

Step 3: Draw orbits containing the proper number of electrons.

We will do nitrogen as an example.



$^{14}_{7}N$

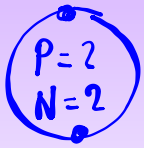
2 — 2 ✓
8 ... 5 ✓
8 7
18 electrons
18

" What happens when electrons lose their energy?"

Bohr-Rutherford Diagram of Nitrogen

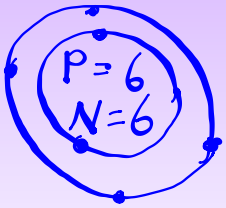
Another example
Try helium

$^{4}_{2}He$



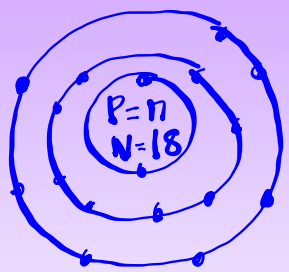
Another Example
Try carbon

$^{12}_{6}C$



Bohr Rutherford Diagram of Chlorine

$^{35}_{17}Cl$



Element name	Element symbol	Atomic #	Mass #	Standard Atomic Notation	# Protons	# Electron	# Neutrons
		74		$^{184}_{74}W$			110
Bismuth			209				
						50	
		99	252				
					35		45

Element name	Element symbol	Atomic #	Mass #	Standard Atomic Notation	# Protons	# Electron	# Neutrons
Tungsten	W	74	184	$^{184}_{74}W$	74	74	110
Bismuth	Bi	83	209	$^{209}_{83}Bi$	83	83	126
Tin	Sn	50	119	$^{119}_{50}Sn$	50	50	69
Einsteinium	Es	99	252	$^{252}_{99}Es$	99	99	153
Bromine	Br	35	80	$^{80}_{35}Br$	35	35	45

Potassium - 39

Atomic Mass = 39

$^{39}_{19}K$

protons 19
neutrons 20
electrons 19

Fluorine-19

$^{19}_{9}F$

protons 9
neutrons 10
electrons 9

Aluminum- 27

$^{27}_{13}Al$

protons 13

neutrons 14

electrons 13

Bohr-Rutherford Diagrams
page 92

Note: in Bohr diagrams the nucleus contains the element symbol, in Bohr-Rutherford diagrams the nucleus contains the number of protons and the number of neutrons.

Now look at Bohr-Rutherford diagrams. Figure 8 pg 92

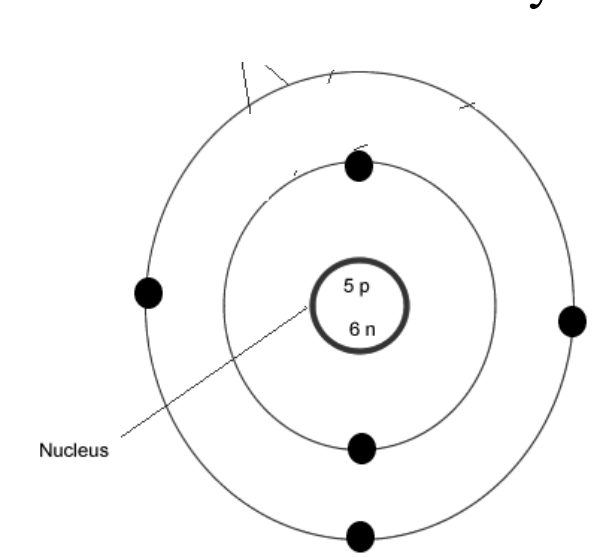
Note: When you see something written like: Mg-24 that means the mass number of magnesium is 24.

Steps for drawing Bohr- Rutherford Diagrams

Step 1: Draw a circle

Step 2: Write the number of protons and neutrons for your element

Step 3: Draw and fill in orbits around your circle



Comparing Bohr Diagrams and Bohr-Rutherford diagrams

Bohr Rutherford Diagram of Nitrogen

Bohr Rutherford Diagram for Hydrogen

Homework
Understanding Concepts Page 93

Questions 4, 5